Operational Energy: ENERGY FOR THE WARFIGHTER

Office of the Assistant Secretary of Defense for Operational Energy Plans and Programs

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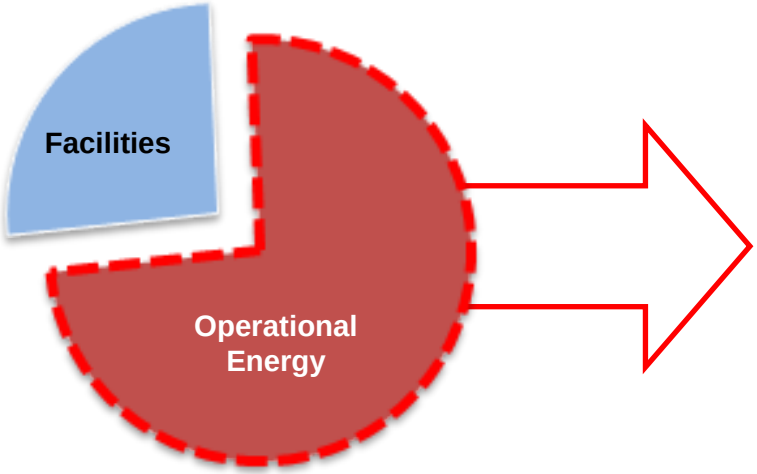
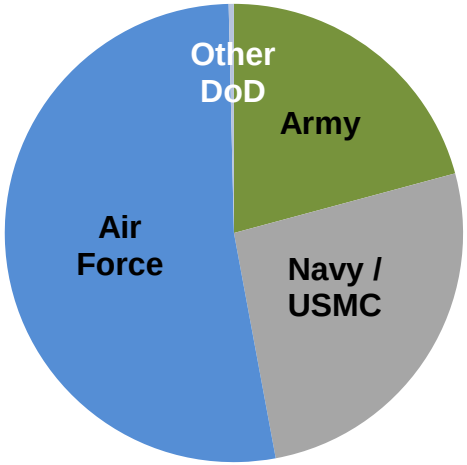
Operational Energy at DoD

DoD Energy Use, FY10[1]



Operational Energy	**74%**
Facilities Energy	**26%**

Operational Energy Use by Service, FY10[2]

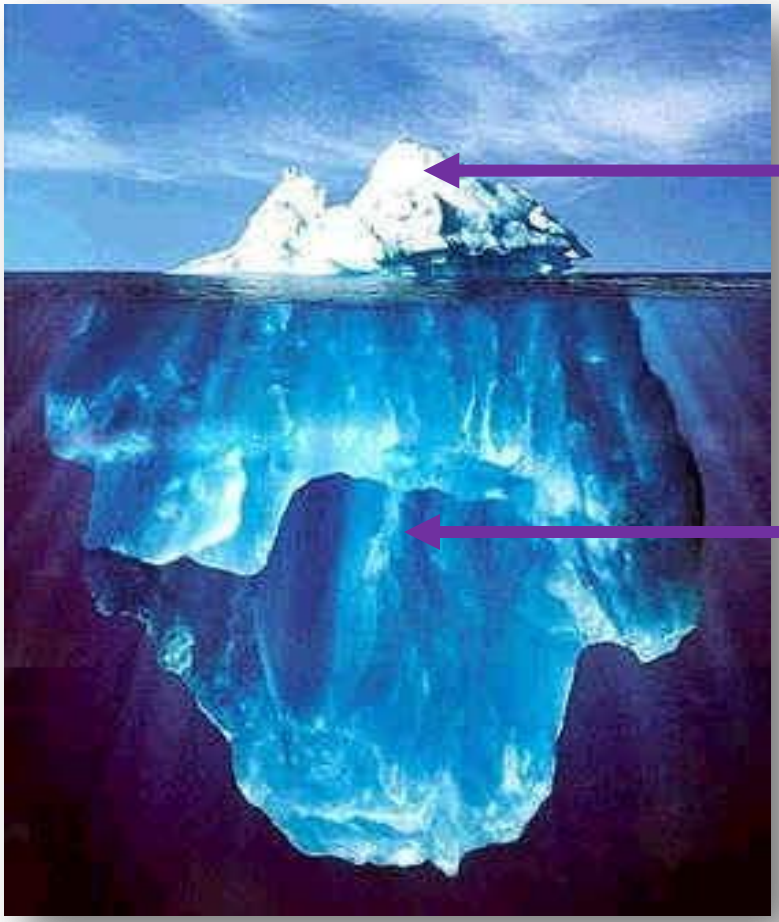


Army	**20.8%**
Navy / USMC	**26.3%**
Air Force	**52.6%**
Other DoD	**0.4%**

[1] FY2010 DoD Annual Energy Management Report, figures by site delivered BTUs
[2] DLA-Energy Fact Book FY2010, Total DoD Sales

Operational Energy – "The energy required for training, moving, and sustaining military forces and weapons platforms for military operations"

More Than Just the Cost of Fuel: Opportunity Costs of Energy



- **Direct Financial Costs**
  - ~$18B to purchase fuel in FY11
- **Indirect Financial Costs**
  - Aerial refueling – AF, USMC tankers
  - Refueling trucks and helicopters
  - Underway replenishment – Navy oilers
- **Operational Costs**
  - Casualties
  - Force protection
  - Time to deploy, employ
  - Ability to disperse
  - Risk of disruption
  - Geopolitical access

Emerging threats are increasing the risks of these indirect costs

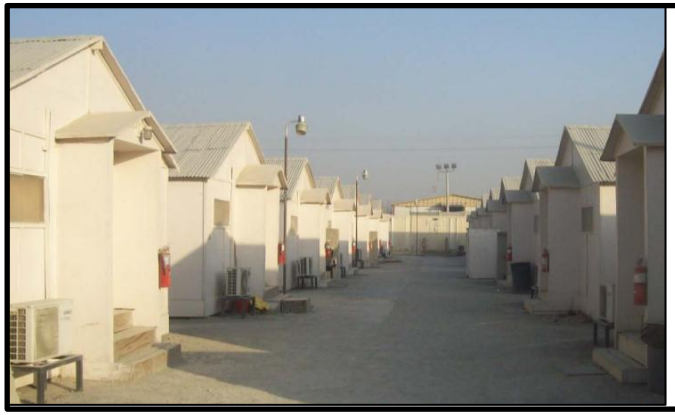
Defense Energy Challenges

- Distributed, complex distribution networks
- Tactical fuel logistics in an irregular battlespace
- Inefficient equipment in theater adds to burden

- Energy choke points
- High and volatile prices
- A2/AD threats to energy affect power projection
- AirSea Battle

- New capabilities with growing energy needs
- Implications for sustainment
- Legacy equipment

Defense Energy Opportunities



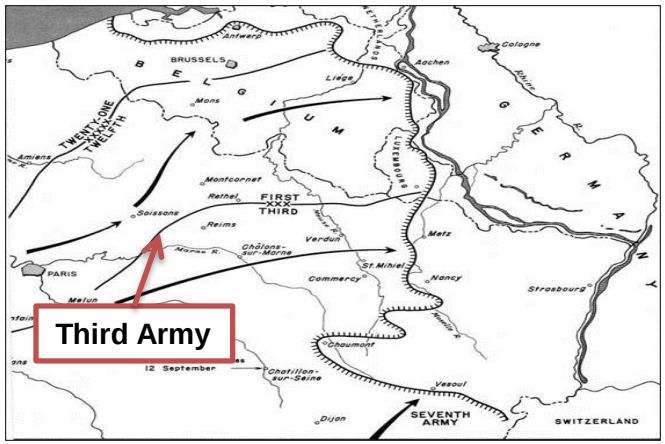
- Centralized power generation
- Energy-efficient shelters, lighting, and heating/air conditioning
- Tactical Solar

- Hybrid electric drives
- Better hull and propeller coatings and stern flaps
- UUVs

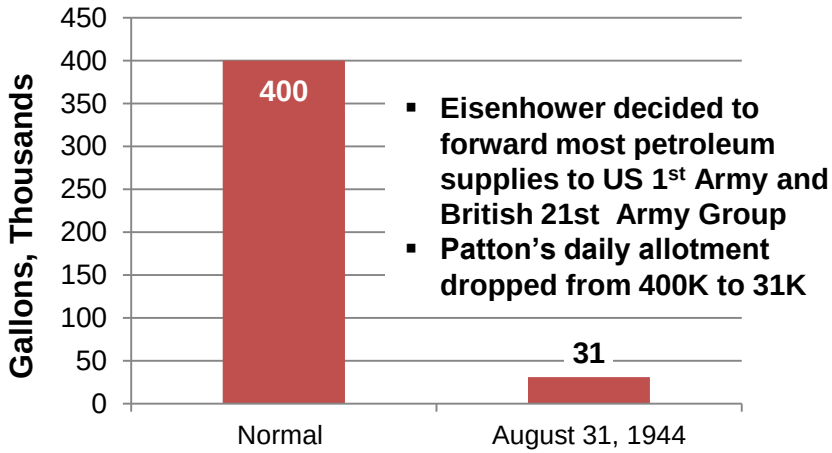
- Improved routing and flight profiles
- Optimized cargo loading and center of gravity
- Engine wash / less drag

Case Study: Army in WWII

- **Rapid advance of US 3rd Army meant limited fuel supplies**
  - Pre-invasion planning based on methodical advance with time to establish depots and bases
  - Difficulties with pipelines and clearing channel ports meant almost all fuel had to come by truck from Normandy via Red Ball Express
- **Fuel shortages forced operational level tradeoffs**
  - Eisenhower forced to choose between sustaining the breakout from Normandy or supporting failed push to Antwerp in Operation Market Garden



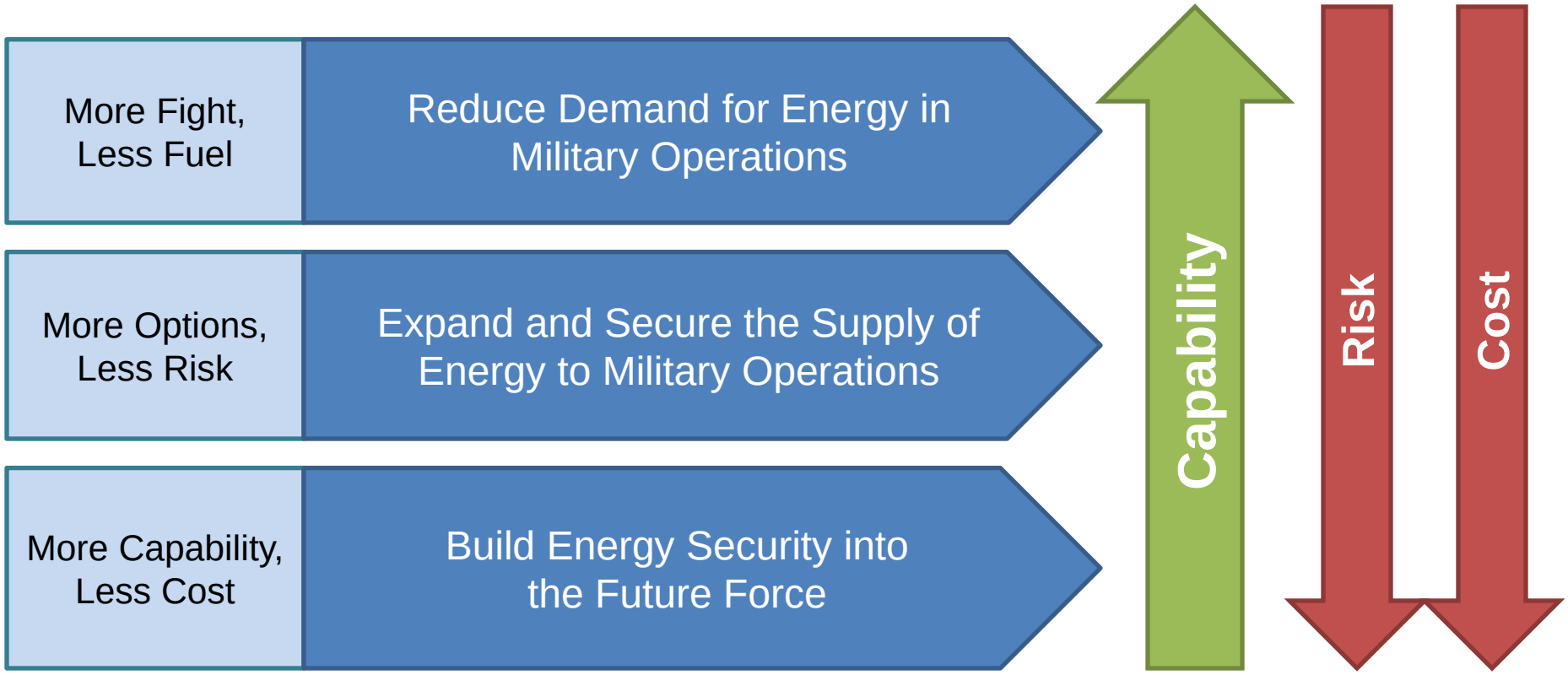
Fuel Supply to US 3rd Army



High fuel demand, geography, and the adversary challenged logistics assumptions – and forced operational tradeoffs

DoD Operational Energy Strategy

- **GOAL: U.S. armed forces will have the energy they require for 21st century military missions**



DoD *Operational Energy Strategy* outlines changes in energy demand, energy supply, and future capabilities

Implementing the Operational Energy Strategy

- Measure Operational Energy Consumption
- Improve Energy Performance and Efficiency
- **Promote Operational Energy Innovation**
- Improve Operational Energy Security at Fixed Installations
- Promote the Development of Alternative Fuels
- Incorporate Energy Security Considerations into Requirements and Acquisition
- Adapt Policy, Doctrine, Professional Military Education, and Combatant Command Activities

Operational Energy Strategy **Implementation Plan includes near-, mid-, and long-term goals to achieve energy security for the warfighter**

S&T Gap Assessment

- ASD(R&E) to identify investment gaps in Department's science and technology (S&T) portfolio necessary to reduce demand, improve system efficiency, and expand supply alternatives

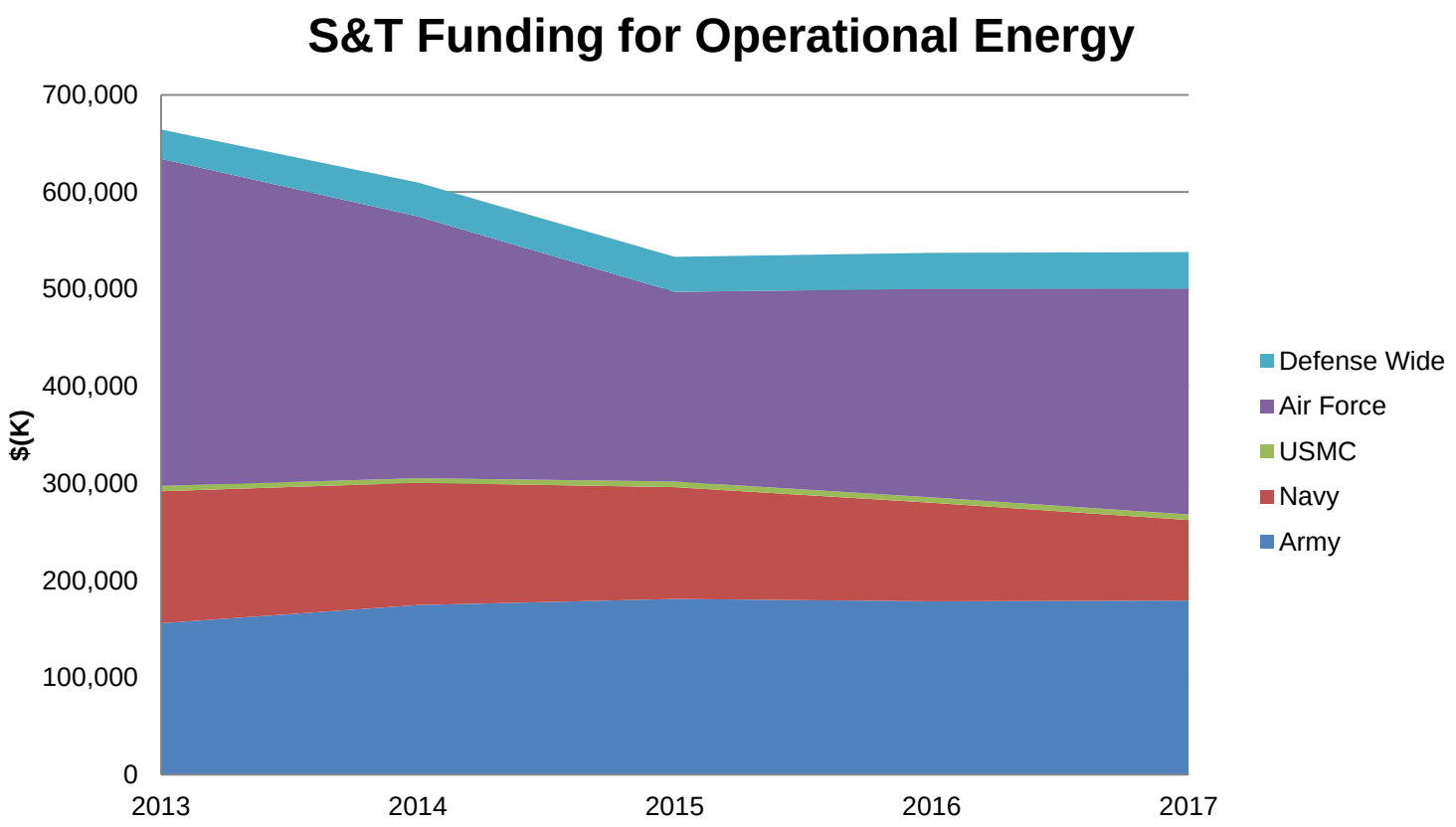
- Effort executed through Energy & Power and Air Platforms Communities of Interest (COIs), Service S&T Executive staff, Service Operational Energy offices, and OASD(OEPP)

- Results to Defense Operational Energy Board in Sep 2012

- Will help set agenda for future action

DoD S&T Investments

- **Total S&T investment across FYDP: $2.9B (32% of total OE investment)**



Improving Energy Use at Contingency Bases

Solutions Must be Carefully Matched to the Operating Location

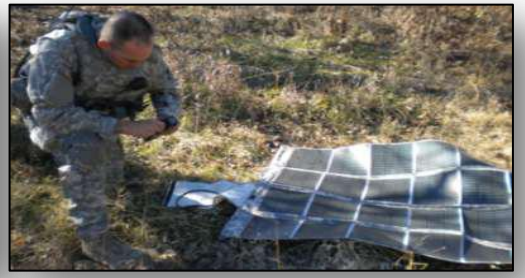
Largest Consumers of Fuel ⟵ ⟶ *Greatest Effort and Risk to Sustain*

Main Logistics Hub – *Bagram*

- Centralized Power Projects
- LOGCAP Energy Services Initiative
- Design standards for temporary and semi-permanent facilities / infrastructure
- Base camp master planning

Tactical Edge – *PB Boldak*

- Energy efficient shelter systems
- Soldier power
- Alternative energy sources



Thoughts Re Multifunctional Materials

- **It's not just joules!**
  - Understand energy burdens and risks in a military context
  - Understand the hurdles in a military context
- **"Green" is nice but makes no sale. How does something make DoD fight better?**
- **Opportunities for Multifunctional Materials**
  - Lightweighting
  - Energy Harvesting
  - Energy Efficiency
    - Improve systems
    - New ways of doing things?

What Does Success Look Like?

- Improving range, endurance, and availability of ground, air, and naval forces
- Lightening the logistics load
- Reduced vulnerability of energy supply lines and forces protecting them
- Refocusing combat forces from protection of supply lines and fuel to operational missions

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http://energy.defense.gov